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CRAIG R. HALBERSTADT, Ph.D.

Education:

Ph.D., Bioengineering	The University of Michigan, Ann Arbor, 1986-1991 Thesis Topic: <i>Design, Implementation and Modeling of a Transtubular Bioreactor for the Growth of Mammalian Cells</i> Thesis Advisors: A. Rees Midgley and Bernhard O. Palsson
M.S., Bioengineering	The University of Michigan, Ann Arbor, 1983-1986
B.S., Microbiology	The University of Michigan, Ann Arbor, 1979-1983

Academic Appointments:

Senior Research Scientist, Director of Tissue Engineering	Cannon Research Center; Carolinas Medical Center; Charlotte, North Carolina
Adjunct Associate Professor	Greenville Hospital System/Clemson University Biomedical Cooperative; Clemson University; Clemson, South Carolina
Adjunct Assistant Professor	University of North Carolina, Charlotte; Department of Biology; Charlotte, North Carolina

Research Experience:	<i>Tissue Engineering</i>	<i>Bioreactor Design</i>
	<i>Process Scale-up</i>	<i>Cell / Biomaterial Interactions</i>

Work Experience:

1996-Present **Senior Research Scientist, Director of Tissue Engineering: Carolinas Medical Center, Charlotte, North Carolina.** Research focus is to develop methodologies for growing three-dimensional, soft tissue analogues that will be utilized for human transplantation. Currently have one corporate sponsored research program: Cell transplantation utilizing a co-culture of Sertoli cells (cells isolated from the testis) and pancreatic islets for the treatment of type I diabetes. We are developing assays, cell isolation protocols, cell/biomaterial constructs and transplantation strategies that will be translatable to a human clinical product. This research project is multi-institutional (University of Alberta) and is being supported by a privately financed company (Sertoli Technologies, Inc.), and grants from the Juvenile Diabetes Foundation International, the North Carolina Biotechnology Center and the Carolinas Medical Center. In addition, in charge of the Human Pancreatic Islet Isolation facility in conjunction with Dr. Paul Gores. Our goal is to reproducibly isolate human pancreatic islets under cGMP for transplantation into Type I diabetic patients in order to eliminate the need of daily insulin injections. Was previously working on an autologous (self) tissue to replace damaged female breast tissue for partial or total breast replacement. We developed three-dimensional templates, cell isolation and growth scenarios, animal models, and bioreactor systems for the *ex vivo* growth of these tissues. This research project was multi-institutional (University of Michigan, University of Massachusetts, Harvard University and MIT) and was supported by a privately financed company (Reprogenesis, Inc.) and the Carolinas Medical Center.

1994-1996 **Director, Tissue Engineering: Desmos Inc., San Diego, California.** Desmos is a small venture based company that is focused on developing tissue-engineered products using a proprietary extracellular matrix protein. This protein, Laminin 5r, is secreted by a mammalian cell in a soluble form and can be purified using conventional protein purification

schemes. Responsibilities included managing a research group of five people, presenting to potential corporate partners, co-authoring a business plan, co-directing the research in the growth of pancreatic islet cells, and directing the effort in the scale-up of an anchorage-dependent mammalian cell line for the production of a biologic. Initiated and supervised collaborations including an islet cell transplantologist at University of California, Los Angeles. Submitted four patents regarding the growth of epithelial tissue using Laminin 5r.

1991-1994

Advanced Tissue Sciences, La Jolla, California

1994

Director, Product Development: Advanced Tissue Sciences, La Jolla, California. Managed a research group of seven people in the development of a large-scale process for the production of a human dermas replacement. Responsibilities included participating on product development teams, co-developed a validation schedule, co-identified documentation for process qualification for the scale-up of two clinical products, and developed experiments for process improvements for the production of these clinical products.

1993-1994

Manager, Bioprocess Research: Segenix (An Advanced Tissue Sciences Company), La Jolla, California. Involved in business development and novel bioreactor design for the growth of human bone marrow and liver tissues. This research lead towards the development of a liver assist extracorporeal device. Co-authored a business plan to further develop this research.

1992-1993

Manager, Bioprocess Research: Advanced Tissue Sciences, La Jolla, California. Managed a group of four people for the development of scale-up processes and bioreactor systems for the growth of a human dermal replacement, which is currently in clinical trials as a medical device. These processes are being incorporated into the scale-up of this product. In addition, helped design and supervise a GLP pre-clinical trial that focused on comparing the *in vitro* grown human dermas with a control. This pivotal trial consisted of 450 athymic mice and was run over a four-month period of time.

1991-1992

Manager, Pilot Production: Advanced Tissue Sciences, La Jolla, California. Managed a GMP facility for clinical production of the human dermal replacement for use in human clinical trials. Initiated and supervised collaborations including: a) three-dimensional growth of cartilage performed at Northshore University Hospital; an affiliate of Cornell University, b) isolation of mesenchymal stem cells at Mercer University of Georgia and c) biomechanical testing of *in vitro* grown human tissue at University of Texas, Arlington. Presented talks and posters at several national and local meetings on the *in vitro* growth of a wide range of tissues including skin, liver, cartilage and bone marrow.

1985-1991

Graduate Student Research Assistant: Department of Chemical Engineering & the Reproductive Sciences Program, The University of Michigan. Developed a bioreactor for the high-density growth of mammalian cells *in vitro*. Co-authored a three year NSF center grant for 1.5 million dollars which was focused on the bioreactor system for the

growth of hybridoma cells. Authored and received a patent on the bioreactor system for the high-density growth of cells. Used this technology for the development of tissues such as capillaries and kidney tubules. In addition, participated on a perfusion project to obtain detailed knowledge on physical and biochemical aspects of a dynamic cell culture system.

- 1986-1989 *Consultant: BioQuant Inc.*, 1919 Green Road, Ann Arbor, Michigan 48105. Co-authored a business plan for the start-up of this company and wrote, defended, and received a competitive grant from the State of Michigan on a bioreactor designed for the growth of mammalian cells. After start-up of the company, continued to consult on bioreactor design and biosensor development.
- 1984-1985 *Teaching Assistant: Department of Chemical Engineering, The University of Michigan.* Industrial Microbiology lab course; duties included the set-up of a course structure, design of experiments, grading criteria and evaluation of student's progress.
- 1983-1984 *Research Assistant: Physical Medicine & Rehabilitation, The University of Michigan.* Worked on developing a B-cell hybridoma specific for rabbit fast myosin. In addition, worked on the development of several biochemical assays for quality control.
- 1983-1984 *Research Assistant: Department of Physiology, The University of Michigan.* Participated in the development of an electrophoresis technique to detect different sub-groups of actin.
- 1981 *Research Assistant: Department of Surgery, Wayne State University, Detroit, Michigan.* Performed canine surgery to monitor cardiac responses to pancreatic shock factor and assisted with the biochemical isolation of this factor.

Honors:

- 1987-1988 Rackham Research Partner Fellowship - University of Michigan

Patents:

1. Eiselt, P., Halberstadt, C., Mooney, D., Yeh, J., Latvala, R., and J.A. Rowley. **Preparing porous hydrogel products**, U.S. Patent #6,511,650 received January 28, 2003.
2. Naughton, B. A., Halberstadt, C.R., and B. Sibanda: **Method for culturing three-dimensional tissue in diffusion gradient bioreactor and use thereof**, U.S. Patent #6,218,182 received April 17, 2001.
3. Burg, K.J.L., Halberstadt, C.R., and Holder, W.D.: **Absorbable Tissue Expander**, U.S. Patent #6,206,930 received March 27, 2001.
4. Halberstadt, C.R.: **Laminin 5 for Periodontal Treatment**, U.S. Patent #6,034,068 received March 7, 2000.
5. Naughton, B. A., Halberstadt, C.R., and B. Sibanda: **Diffusion Gradient Bioreactor and**

Extracorporeal Liver Device, U.S. Patent #6,008,049 received December 28, 1999.

6. Naughton, B. A., Halberstadt, C.R., and B. Sibanda: **Diffusion Gradient Bioreactor and Extracorporeal Liver Device Using a Three-Dimensional Liver Tissue**, U.S. Patent #5,827,729 received October 27, 1998.
7. Halberstadt, C., Zimmer, M., and J. J. Grzesiak: **Growth of Adult Pancreatic Islet Cells**, U.S. Patent # 5,681,587 received on October 28, 1997.
8. Halberstadt, C. and J. J. Grzesiak: **Laminin-5 for Growth of Pancreatic Islet Cells**, U.S. Patent # 5,672,361 received on September 30, 1997.
9. Halberstadt, C.R. and A.R. Midgley: **Bioreactor System**, U.S. Patent #5,081,035 received on January 14, 1992

Two patents have been filed with Sertoli Technologies, Inc. on Gene Therapy application (2001)

Two patent applications has been filed through the Carolinas Medical Center for tissue engineering applications (1998)

One patent application filed jointly with David Mooney at the University of Michigan on tissue engineering (1998)

Publications:

1. Dufour, J.M., Gores, P., Hemendinger, R., Emerich, D.F., and C.R. Halberstadt. **Transgenic Sertoli cells as a vehicle for gene therapy**. Accepted in Cell Transplantation.
2. Dufour, J.M. Hemendinger, R., Halberstadt, C.R., Gores, P., Emerich, D.F., Korbitt, G.S. and R.V. Rajotte. **Genetically Engineered Sertoli Cells Are Able To Survive Allogeneic Transplantation**. Accepted Gene Therapy
3. He, W., Halberstadt, C.R., and K.E. Gonsalves. **Spatial Organization of Fibroblast Cells Using a Novel Biocompatible Chemically Amplified Photoresist**. Submitted to Advanced Materials
4. He, W., Halberstadt, C.R., and K.E. Gonsalves. **Lithography application of a novel photoresist for patterning of cells**. Accepted in Biomaterials.
5. Emerich, D.F., Hemendinger, R. and C. Halberstadt. **The testicular derived Sertoli cell: cellular immunoscience to enable transplantation**. *Cell Transplantation*, 12:335-349, 2003.
6. Gores, P.F., Hayes, D.H., Copeland, M.J., Korbitt, G., Halberstadt, C., Kirkpatrick, S.A., and R.V. Rajotte. **Long-term survival of intratesticular porcine islets in non-immunosuppressed beagles**. *Transplantation*, 15;75(5):613-618, March, 2003.
7. He, W., Gonsalves, K., and C. Halberstadt. **Synthesis, Characterization, and Preliminary Biological Study of Poly(3-(t-butoxycarbonyl)-N-vinyl-2-pyrrolidone)**. *Biomacromolecules*, 4(1):75-79, Jan 13, 2003.

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8. Halberstadt, C.R., Palsson, B.O., Midgley, A.R., and R.L. Curl. **Optimization and Mathematical Modeling of the Transubular Reactor for the Production of Monoclonal Antibody from a Hybridoma Cell Line.** *Biotechnology and Bioprocess Engineering*, 7(3):163-170, 2002.
 9. Burg, K.J.L., Delnomdedieu, M., Beiler, R.J., Culberson, C.R., Greene, K.G., Halberstadt, C.R., Holder, W.D. Jr, Loeb sack, A.B., Roland W.D., and G.A. Johnson. **Application of Magnetic Resonance Microscopy to Tissue Engineering: A Polylactide Model.** *Journal of Biomedical Materials Research*, 61(3):380-390, 2002.
 10. Hemendinger, R., Gores, P., Blacksten, L., Harley V., and C. Halberstadt. **Identification of a specific Sertoli cell marker, Sox9, for use in transplantation.** *Cell Transplantation*, 11(6):499-505, 2002.
 11. Halberstadt, C., Austin, C., Rowley, J., Culberson, C., Loeb sack, A., Wyatt, S., Coleman, S., Blacksten, L., Burg, K., Mooney, D., and W. Holder Jr. **A Hydrogel Material for Plastic and Reconstructive Applications Injected into the Subcutaneous Space of a Sheep.** *Tissue Engineering*, 8(2):309-319, 2002.
 12. Loeb sack, A., Greene, K., Wyatt, S., Culberson, C., Austin, C., Beiler, R., Roland, W., Eiselt, P., Rowley, J., Burg, K., Mooney, D., Holder, W., and C. Halberstadt. **In Vivo Characterization of a Porous Hydrogel Material for Use as a Tissue Bulking Agent.** *Journal of Biomedical Materials Research*, 57:575-581, 2001.
 13. Halberstadt, C. **The Creation of an Immunoprotective Environment Utilizing the Testis-Derived Sertoli Cell.** *Journal of Anatomy and Physiology*, In Press.
 14. Burg, K.J.L., Holder, W.D., Culberson, C.R., Beiler, R.J., Greene, K.G., Loeb sack, A.B., Roland, W.D., Eiselt, P., Mooney, D.J., and C.R. Halberstadt. **Comparative Study of Seeding Methods for Three-Dimensional Polymeric Scaffolds.** *Journal of Biomedical Materials Research*, 51(4):642-649, 2000.
 15. Burg, K.J., Culberson, C.R., Greene, K.G., Loeb sack, A.B., Roland, W.R., Holder, W.D., Halberstadt, C.R., and R.J., Beiler. **Absorbable Mesh Aids in Development of Discrete Tissue-Engineered Constructs.** *Critical Reviews in Biomedical Engineering*. Volume 28 (3-4):383-387, 2000.
 16. Loeb sack, A.B., Halberstadt, C.R., Holder, W.D., Jr., Gruber, H.E., Culberson C.R., Greene, K.G., Roland, W.D., and K.J.L. Burg. **The Development of an Embedding Technique for Polylactide Sponges.** *Journal of Biomaterials Science*, 48:504-510, 1999.
 17. Burg, K.J.L., Holder, W.D., Culberson, C.R., Beiler, R.J., Greene, K.G., Loeb sack, A.B., Roland, W.D., Mooney, D.J., and C.R. Halberstadt. **Parameters Affecting Cellular Adhesion to Polylactide Films.** *Journal of Biomaterials Science – Polymer Edition*, 10(2):147-161, 1999.
 18. Todorov, I.T., Scheyhing, K.I., Grzesiak, J.J., Cruz-Arranda, G., Stubban, C.B., Mullen, Y., Halberstadt, C.R., Jones, J.C. **Expansion of Functional Adult Porcine Islet Cells In Vitro Using Purified Laminin 5.** *Transplant Proc.*, Mar; 30(2):455, 1998.
 19. Eiselt, P., Kim, B.-S., Chacko, B., Isenberg, B., Peters, M.C., Greene, K.G., Roland, W.D., Loeb sack, A.B., Burg, K.J.L., Culberson, C., Halberstadt, C.R., Holder, W.D., and D.J. Mooney. **Development of Technologies Aiding Large-Tissue Engineering.** *Biotechnology Progress*, 14:134-140, 1998.

20. Grande, D.A., Halberstadt, C., Naughton, G., Schwartz, R. and R. Manji: **Evaluation of Matrix Scaffolds for Tissue Engineering of Articular Cartilage Grafts.** *Journal of Biomedical Materials Research*, 34, #2:211-220, 1997.
21. Sacks, M.S., Chuong, C.J., Petroll, W.M., Kwan, M., and C. Halberstadt: **Collagen Fiber Architecture of a Cultured Dermal Tissue.** *Journal of Biomechanical Engineering*, 119(1): 124-127, 1997.
22. Halberstadt, C.R., Hardin, R., Bezverkov, K., Snyder, D., Allen, L. and L. Landeen: **The *In Vitro* Growth of a Three-Dimensional Human Dermal Replacement Using a Single-Pass Perfusion System.** *Biotechnology and Bioengineering*, 43:740-746, 1994.
23. Landeen, L.K., Ziegler, F.C., Halberstadt, C.R., Cohen, C. and S.R. Slivka: **Characterization of a Human Dermal Replacement.** *Wounds*, 4(5):167-175, September-October, 1992.
24. Halberstadt, C.R., Anderson, P., Bartel, R., Cohen, R. and G. Naughton: **Physiological Cultured Skin Substitutes for Wound Healing in Materials Research Society Symposium Proceedings**, 252:323-330, 1992.
25. Ozturk, S.S., Palsson, B.O., Midgley, A.R., and C.R. Halberstadt: **Transtubular Bioreactor: A Perfusion Device for Mammalian Cell Cultivation.** *Biotechnology Techniques*: 3(1):55-60, 1989.

Book Chapters:

Lee, K.Y., Halberstadt, C.R., Holder, W.D., and D.J. Mooney. **Tissue Engineering for Breast Reconstruction.** *Principles of Tissue Engineering (2nd Edition)*. Editors: R.Lanza, R. Langer and J. Vacanti. Academic Press, NY, NY: 409-425, 2000.

Abstracts:

1. He W., Gonsalves K.E., and Halberstadt C. **The Development and Characterization of a Novel BIORESIST for the Spatial Organization of Mammalian Cells.** Materials Research Society, Boston, MA. Accepted for presentation, December 4th, 2003.
2. Gonsalves, K.E., Halberstadt, C.R., He, W., and A. Ali. **Bioresist for Cell Patterning.** Southern Biomedical Engineering Conference and Symposium on Aortic Valve Sparing Surgery., Charlotte, North Carolina. Accepted for presentation, September 26-28, 2003.
3. Lyles M.B., Halberstadt C., Hemendinger R., Fiechtel J., Kellam, J.F., McAllister B., and Martell J. **Use of a novel polymeric inorganic matrix in bone healing.** Presented at Cold Spring Harbor Tissue Engineering Meeting, Cold Spring harbor, New York, November 21-24, 2002.
4. Harold K.L., He W., Halberstadt C.R., Matthews B.D., Kercher K.W., Sing R.F., Heniford T. **Fibroblast Adherence and Proliferation on Prosthetic Mesh *In Vitro*.** Presented at the American Hernia Society meeting, Tucson AZ, May 8-12, 2002.
5. Hemendinger R., Swiggett J., Rounds D., Gores P. and Halberstadt C. **Assessment of Viability of Both Monolayers of Cells and 3-Dimensional Multicellular Aggregates using Confocal Microscopy.** Presented at the Third Annual Tissue Engineering Society Meeting, Orlando, FL. December 1-3, 2000.
6. Coleman S., Austin C., Culbertson C., Loebbeck A., Morton D., Holder W., and Halberstadt C.

Isolation and Characterization of Pre-adipocytes Obtained from Liposuction for Use in Soft Tissue Engineering. Presented at the Third Annual Tissue Engineering Society Meeting, Orlando, FL. December 1-3, 2000.

7. Halberstadt C., Austin C., Rowley J., Culberson C., Loeb sack A., Wyatt S., Coleman S., Blacksten L., Burg K., Mooney D., and Holder W. **A Hydrogel Material for Plastic and Reconstructive Applications Injected into the Subcutaneous Space of a Sheep.** Presented at the Third Annual Tissue Engineering Society Meeting, Orlando, FL. December 1-3, 2000.
8. Austin C., Greene K., Culberson C., Wyatt S., Blacksten L., Halberstadt C., and Holder, Jr. W. **Ultrasound as a Noninvasive Method to Monitor Biodegradable, Subcutaneous Implants in Animal Models.** Presented at the Third Annual Tissue Engineering Society Meeting, Orlando, FL. December 1-3, 2000.
9. Halberstadt, CR, Mooney, DJ, Burg, KJL, Eiselt, P, Rowley, JA, Beiler, RJ, Roland, WD, Austin, CE, Culberson, CR, Greene, KG, Wyatt, S, Loeb sack, AB, and Holder, WD Jr, **The Design and Implementation of an Alginate Material for Soft Tissue Engineering.** Presented at the Sixth World Biomaterials Congress, Hawaii, Hawaii, May 15-20, 2000.
10. Burg KJL, Austin CE, Mooney DJ, Eiselt P, Yeh J, Rowley JA, Culberson CR, Greene KG, Holder WD Jr., Loeb sack AB, Wyatt S, and Halberstadt CR. **Optimizing Microstructure of Porous Alginate-RGD beads for Tissue Engineering Application.** Presented at the Sixth World Biomaterials Congress, Hawaii, Hawaii, May 15-20, 2000.
11. Greene, KG, Burg, KJL, Austin, CE, Culberson, CR, Halberstadt, CR, Holder, WD Jr, Morton, DS, Wyatt, S, and Loeb sack, AB. **The Development of a Seeding Method for a Porous Hydrogel Construct.** Presented at the Sixth World Biomaterials Congress, Hawaii, Hawaii, May 15-20, 2000.
12. Evans, L, Austin, C, Dreau, D, Morton, D, Coleman, S, Swiggett, J, Loeb sack, A, Holder, W, Klitzman, B, and Halberstadt, C. **Characteristics of Green Fluorescent Protein-Labeled Human Pre-Adipocytes** Presented at the Third Annual North Carolina Tissue Engineering Society Meeting, Durham, North Carolina, April 7, 2000.
13. Coleman, S, Austin, C, Culberson, C, Loeb sack, A, Morton, D, Holder, W, and Halberstadt, C. **Isolation of Pre-adipocytes from Liposuction.** Presented at the Third Annual North Carolina Tissue Engineering Society Meeting, Durham, North Carolina, April 7, 2000.
14. Hemendinger, R, Williams, C, Rounds, D, Wyatt, S, Blacksten, L, Gores, P and Halberstadt, C. **Time-dependent formation of an ectopic testicular structure in a subcutaneous purse-string suture site in female Lewis rats.** Presented at the Third Annual North Carolina Tissue Engineering Society Meeting, Durham, North Carolina, April 7, 2000.
15. Hemendinger, R., Halberstadt, C., Rounds, D., Wyatt, S., Field, J. and Gores, P. **Characterization and transplantation of a 'pure' preparation of Sertoli cells in the rat.** Presented at the Second Annual Southeastern Tissue Engineering Conference, Charlotte, N.C., July 10, 1999.
16. Burg, K.J.L., Mikos, A.G., Beiler, R.J., Culberson, C.R., Greene, K.G., Loeb sack, A.B., Roland, W.D., Wyatt, S., Halberstadt, C.R., Holder, W.D., Jr., and T.C. Burg. **Particulate Selection and Implantation to Cell Adhesion in Solvent-Cast, Particulate-Leached Polymeric Constructs.** Presented at the Society for Biomaterials Meeting, Providence, Rhode Island, April 28 - May 2, 1999.

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17. Roland, WD, Holder, WD, Culberson, CR, Beiler, RJ, Burg, KJL, Greene, KG, Loeb sack, AB, Wyatt, S, and *CR Halberstadt*. **Optimizing Cell Culture Time and Seeding Density on Porous, Absorbable Constructs**. Presented at the Tissue Engineering Society Meeting, Orlando, Florida, December 4-6, 1998.
 18. Burg, KJL., Holder, WD, Jr., Culberson, CR, Beiler, RJ, Greene, KG, Loeb sack, AB, Roland, WD, and *CR Halberstadt*. **Selection of Seeding Methods Toward Enhanced Vascularization of Porous, Absorbable Constructs**. Presented at the Tissue Engineering Society Meeting, Orlando, Florida, December 4-6, 1998.
 19. Burg, KJL, Delnomdedieu, M, Beiler, RJ, Culberson, CR, Greene, KG, Loeb sack, AB, Roland, WD, Wyatt, S, *Halberstadt, CR*, Holder, WD, Jr., and GA Johnson. **Application of Magnetic Resonance Microscopy to Tissue Engineering**. Presented at the Tissue Engineering Society Meeting, Orlando, Florida, December 4-6, 1998.
 20. Greene, KG, *Halberstadt, CR*, Holder, WD, Jr., Culberson, CR, Beiler, RJ, Loeb sack, AB, Roland, WD, Yeh, J, Mooney, DJ, and KJL Burg. **In Vivo Cellular Invasion of Novel Porous PLGA Matrices**. Presented at the Tissue Engineering Society Meeting, Orlando, Florida, December 4-6, 1998.
 21. Burg, KJL, Holder, WD, Jr., Culberson, CR, Beiler, RJ, Greene, KG, Loeb sack, AB, Roland, WD, and *CR Halberstadt*. **Alginate Processing Parameters and Influence on Cellular Attachment**. Presented at the Biomedical Engineering Society Meeting, Cleveland, Ohio, October 10-13, 1998.
 22. Burg, KJL, Holder, WD, Jr., Culberson, CR, Beiler, RJ, Greene, KG, Loeb sack, AB, Roland, WD, Eiselt, P, Mooney, DJ, and *CR Halberstadt*. **A Study of Tissue Engineering Seeding and Proliferation Methods**. Presented to the Society for Biomaterials Annual Meeting, San Diego, California, April 22-26, 1998.
 23. Loeb sack, AB, *Halberstadt, CR*, Holder, W.D., Jr., Gruber, H.E., Culberson C.R., Greene, K.G., Roland, W.D., and KJL Burg. **The Development of an Embedding Technique for Polylactide Sponges**. Presented to the Society for Biomaterials Annual Meeting, San Diego, California, April 22-26, 1998.
 24. Todorov, I.T., Scheyhing, K.I., Grzesiak, J.J., Cruz, G., Mullen, Y., *Halberstadt, C.R.*, and J.R. Jones. **Expansion of Functional Adult Porcine Islet Cells *In Vitro* Using Purified Laminin 5**. Presented at the 6th Congress of the International Pancreas and Islet Transplant Association Meeting, Milan, Italy, October, 1997.
 25. Scheyhing, K.I., Grzesiak, J.J., Cruz, G., Mullen, Y., Jones, J.R., *Halberstadt, C.R.*, and I. T. Todorov. **Purified Laminin 5 Promotes Cell Proliferation and Expansion of Adult porcine islet Cells *In Vitro***. Presented at the American Diabetes Meeting, May 19, 1997, Boston MA.
 26. Burg, K.J.L., Mooney, D.J., *Halberstadt, C.R.*, Culberson, C.R., Black, M.C., Moore, A.L., Roland, W., and W. Holder. **Parameters Affecting Cellular Adhesion to Polyglycolide and Polylactide Porous Constructs**. Presented at the American Chemical Society Meeting, April 16-20, 1997, San Francisco, California.
 27. *Halberstadt, C.R.*, Zimber, M., Cruz, G., Mullen, Y., Quaranta, V. Glaser, S. and J. Grzesiak: **Expansion of Adult Porcine Islet Cells Using Laminin-5r**. Presented at the Keystone Tissue Engineering Symposium, January, 1996, Taos, New Mexico.

28. Sacks, M., Chuong, C.J., *Halberstadt, C.*, and M. Kwan: **Collagen Fiber Architecture of Cultured Dermal Tissue Measured Using Small Angle Light Scattering**. Presented at the meeting of The American Society of Mechanical Engineers, November 28-December 3, 1993, New Orleans, Louisiana.
29. Landeen, L.K., Kidd, I.D., and *C.R. Halberstadt*: **Extracellular Matrix Deposition is Influenced by Lactic Acid in a Human Dermal Replacement**. Presented at the meeting of the Congress on Cell and Tissue Culture, June 5-9, 1993, San Diego, CA.
30. Hardin, R.J., Bezverkov, K.I., Snyder, D.A., and *C.R. Halberstadt*: **The Growth of a Three-Dimensional Dermal Equivalent Using a Single-Pass Perfusion System**. Presented at the meeting of the Congress on Cell and Tissue Culture, June 5-9, 1993, San Diego, CA.
31. Landeen, L.K., *Halberstadt, C.R.*, King, B.D., and G.K. Naughton: **A Novel Human Dermal Replacement: Characterization and Early Clinical Trials**. Presented at the meeting of the Society for Investigative Dermatology, April 4-9, 1993, Washington, D.C.
32. *Halberstadt, C.R.*, Hardin, R., Bezverkov, K., and M. Kwan: **The Development of a Perfusion System for the Growth of a Three-Dimensional Dermal Equivalent**. Presented at the American Chemical Society meeting, March 28-31, 1993, Denver, CO.
33. Landeen, L., Kidd, I.D., and *C.R. Halberstadt*: **Effects of Lactic Acid on Cell Growth and Extracellular Matrix Deposition in a Human Dermal Replacement**. Presented at the Pan Pacific Regional Meeting of the International Society for Burn Injuries, February 22-26, 1993.
34. Grande, D., *Halberstadt, C.*, Schwartz, R., Linton, J., and G. Naughton: **Evaluation of Extracellular Matrix Scaffolds for Engineering of Articular Cartilage Grafts**. Presented at the Meeting of the Orthopedic Research Society, February 15-18, 1993, San Francisco, CA.
35. *Halberstadt, C.R.*: **Tear Strength Properties of a Novel Cultured Dermal Tissue Model**. Presented at the Medical Research Forum on Wound Repair/Symposium on Advanced Wound Care, April 23-25, 1992, New Orleans, Louisiana.
36. Grande, D., *Halberstadt, C.R.*, Linton, J. and G. Naughton: **A Culture System for the Three-Dimensional Growth of Cartilage**. Presented at the Keystone Tissue Engineering Symposium, April, 1992, Keystone, Colorado.
37. *Halberstadt, C.R.*, Slivka, S., Ziegler, F., Zimber, M.P. and R.K. Bartel: **The Development, Characterization and Clinical Use of a Three-Dimensional Dermal Equivalent**. Presented at the Keystone Tissue Engineering Symposium, April, 1992, Keystone, Colorado.
38. Naughton, B.A., Sibanda, B., San Ramon, J. and *C.R. Halberstadt*: **A Three-Dimensional System for the Long-Term Culture of Hepatic Parenchymal Cells**. Presented at the Keystone Tissue Engineering Symposium, April, 1992, Keystone, Colorado.
39. Naughton, B.A., Sibanda, B., San Ramon, J. and *C.R. Halberstadt*: **Hematopoiesis on Suspended Nylon Screen Structures in Microgravity Simulators**. Presented at the Keystone Tissue Engineering Symposium, April, 1992, Keystone, Colorado.
40. Cohen, R., *Halberstadt, C.R.*, Cooper, M. and J. Hansbrough: **Physiological Cultured Skin Substitutes for Wound Healing**. Presented at the Materials Research Society Meeting, December 2-6, 1991, Boston, Massachusetts.

41. Slivka, S.R., *Halberstadt, C.R.*, Landeen, L., Zimmer, M.P. and R.L. Bartel: **Characterization of a Three-Dimensional Cultured Human Skin Model**. Presented at the American Institute of Chemical Engineering Annual Meeting, November, 1991, Los Angeles, California.
42. Ozturk, S.S., *Halberstadt, C.R.*, Midgley, A.R. and B.O. Palsson: **Transtubular Bioreactor: Characterization and Potential Use for Mammalian Cell Cultivation**. Presented at the AIChE Meeting November 15-20, 1987, New York, New York.
43. *Halberstadt, C.R.*, Ozturk, S.S., Smith, R.H., Palsson, B.O., and A.R. Midgley: **A Novel Mammalian Bioreactor with Transtubular Convective Flow**. Presented August 31, 1987 at the 194th ACS National Meeting, New Orleans, Louisiana.

Invited Seminars:

- "Human Islet Transplantation – The CMC Experience" Presented at the University of North Carolina Charlotte Biotechnology Conference, September 23, 2003.
- "Development of a novel hydrogel material for soft tissue reconstruction" Presented at the Chemistry / Biology Combined Seminar, University of North Carolina, Charlotte, February 10, 2003.
- "Adipose Tissue Engineering" Presented at the Fourth Annual Southeastern Tissue Engineering Conference, Research Triangle Park, North Carolina, June 7, 2002
- "Tissue Engineering: It's More than Just Puffs or Kleenex," Presented at Surgical Grand Rounds at the Carolinas Medical Center, Charlotte, North Carolina, May 11, 2001.
- "The Creation of an Immunoprotective Environment Utilizing the Testis-Derived Sertoli Cell," Presented at the 14th Annual Human Anatomy and Physiology Society, Charlotte, N.C., June 12, 2000.
- "Sertoli Cell /Islet Co-transplantation," Presented at the Second Annual Southeastern Tissue Engineering Conference, Charlotte, N.C., July 10, 1999
- "3-D Vascular Structure for Soft Tissue Repair," Presented at the Advancements in Tissue Engineering Symposia, Boston, MA, June 21-22, 1999.
- "Tissue Engineering at the Carolinas Medical Center," Presented at the First Annual Southeastern Tissue Engineering Conference, June, 1998.
- "Soft Tissue Engineering," Presented at the University of North Carolina at Charlotte; August 29th, 1997.
- "Soft Tissue Engineering," Presented at Clemson University; September 3rd, 1997
- "Bioreactor Design," Presented to Dr. R. Langer's Laboratory at the Massachusetts Institute of Technology; June 29, 1993.

Scientific Advisory Consultation:

- Scientific Advisory Board Member - Sertoli Technologies, Inc.; 1997 – 2003
- Scientific Advisory Consultant - Reprogenesis, Inc.; 1997 - 2000
- Scientific Consultant - Desmos, Incorporated; November 1996 - 1998

Committees:

- State of Texas Advanced Technology Program Review Committee, October 10-12, 2003
- Symposia organizer for Nanotechnology and Tissue Engineering for December, 2004 Materials Research Society Meeting
- State of Texas Advanced Technology Program Review Committee, September 10-12, 1999
- NIH Review Committee, Special Emphasis Panel (ZRG1-SSS5-05B), July 29-30, 1999

- Steering Committee Member for the North Carolina Tissue Engineering Society 2001-2003
- Chairman of the Hybrid Artificial Organs Special Interest Group of the Society for Biomaterials (1998 – 2000)
- Member of the Research Review Committee for the Carolinas Medical Center (1998 – Present)

Research Support:

- **Breast Bioprosthesis Project** - Supported by the Carolina Tissue Development Partners (October, 1994 – December, 1998); Supported by Reprogenesis, Inc. (January, 1999 – June 2000)
Funded: October, 1994 - June, 2000
Total Funded: \$ 5.0 MM
The long-term goal of this project is to develop an autologous tissue engineered construct for the augmentation of soft tissue defects. The specific aims of the project are to: 1) Develop a biomaterial that can support cell adhesion, promote tissue ingrowth, prevent a fibrotic capsule from forming, induces a minimal inflammatory response, and can be implanted using a minimally invasive procedure; 2) Identify a strategy for creating a three-dimensional vascular bed; 3) Develop a reproducible methodology for isolating, expanding and differentiating human pre-adipocytes; 4) Utilize small animal models for the development of transplant strategies and 5) Develop a large pre-clinical animal model. The project is currently in the small and large animal phase with a biomaterial that was co-developed between our laboratory at the Carolinas Medical Center and Dr. David Mooney at the University of Michigan.
- **Sertoli / Islet Project** - Supported by Sertoli Technologies, Inc. and a grant from the Juvenile Diabetes Foundation International
Funded: January 1998 – March 2003
Total Funded: \$1.6MM
This is a sponsored research project based on early observations that Sertoli cells isolated from the testis will establish a local immunoprotective barrier for allogeneic pancreatic islets in a diabetic rodent model. The specific aims of this project are to: 1) Develop a reproducible Sertoli cell isolation process; 2) Develop in vitro and in vivo characterization assays and identify specific markers for eventual quality control tests; 3) Identify a clinically relevant site in both a small and large animal model; 4) Develop a biomaterial construct in order to co-localize the Sertoli cells and the islets; 5) Develop a transplantation strategy for a allogeneic pre-clinical model; 6) Perform parallel experiments with porcine tissue; and 7) Transfer this technology to further product development and clinical trials. This is a multi-disciplinary project that is being jointly developed by our laboratory at the Carolinas Medical Center and Drs. Ray Rajotte and Greg Korbitt at the University of Alberta and is in the early stages of development.
- **North Carolina Biotechnology Center: Competitive grant** awarded for \$250 K with matching funds provided from the Carolinas Medical Center for the purchase of a Laser-Scanning Confocal Microscope
Total Funded: \$452 K
Purchased a Leica TCS two-photon laser-scanning microscope with a separate image analysis system with the use of the awarded funds.
- **North Carolina Biotechnology Center: Competitive grant** awarded for \$30 K with matching funds provided from Sertoli Technologies and the Carolinas Medical Center of \$30 K for a Post-Doctoral Fellow for the Sertoli / Islet Project

Funded: December 1998 – December 1999

Total Funded: \$60.K

This is a post-doctoral grant that is supporting one post-doctoral fellow to characterize the Sertoli cell preparations. The specific aims are to develop both in vitro and in vivo characterization assays and to attempt to correlate various age specific Sertoli cell markers with functional outcome.

- North Carolina Biotechnology Center: Awarded a Competitive grant for \$30 K with matching funds provided from Sertoli Technologies and the Carolinas Medical Center of \$30 K for a Post-Doctoral Fellow for the Sertoli / Islet Project
December 1999– December 2000
This is a post-doctoral grant that is supporting one post-doctoral fellow to characterize the Sertoli cell preparations. The specific aims are to develop both in vitro and in vivo characterization assays and to attempt to correlate various age specific Sertoli cell markers with functional outcome

Research Fellows and Students:

- Ph.D. Graduate student: Wei He, Materials Science, University of Connecticut – 2001 – 2003.
- Ph.D. Thesis committee member: Sherine Fawzi Elsawa, Biology – UNCC - 2003
- Post-Doctoral Fellow: Richelle Hemendinger, Ph.D. (Cell Biology) - 1998 – 2001
- Post-Doctoral Fellow: Karen Burg, Ph.D. (Bioengineering) - 1996 - 1998
- Post-Doctoral Fellow: Betsy Claassen, Ph.D. (Bioengineering) - 1998 – 1999
- Graduate Student: Lillian Evans, A 3rd year medical student at Duke University – 1999-2000.

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